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AN INDEX OF INDUSTRIAL STOCK PRICES

EDWIN FRICKEY

I. THE RESULTS

MONTHLY index numbers of industrial stock prices for the period 1902–21, computed by averaging the quotations for the common and the preferred shares of twenty manufacturing companies, are presented graphically in Chart I.[1] The two series of common and preferred stock indices exhibit marked cyclical fluctuations. These series agree in their indication of the dates at which the important upward and downward swings began, but as might be expected, the common stock index fluctuates much more violently than does the preferred.

Looking at the curves of Chart I, we see that during the year 1902 the trend of the common stock index was slightly upward, while that of the preferred stock index was practically horizontal. Early in 1903 both indices began a downward movement which lasted for about ten months. There was little recovery until the middle of the following year. Beginning with July 1904 a sharp upward movement took place, reaching its highest point in January 1906. There then followed in succession the bear market of 1906–07 and the bull market of 1908–09. Stock prices again declined in 1910 and 1911, but did not reach nearly so low a level as they had at the end of the two preceding slumps. The period 1912–14 was one in which fluctuations in security prices were much less violent than during the decade preceding; there was slight recovery in 1912, followed by moderate decline during the two following years.

The most noticeable feature of the period 1915–18 is the divergence which took place between the movements of the common and the preferred stock indices. During the war years the increased earning power of various industrial corporations reflected itself in the quotations of the common shares, and the common stock index rose until it reached figures considerably above the average for 1902–14; the preferred stocks, except for the relatively small number whose dividend-paying records had been poor during the pre-war period, benefited very much less from the increase of profits, and their prices, on the whole, showed comparatively little change from the pre-war level.

Examining in greater detail the movements of the indices through the war period, we see that the year 1914 closed with prices at a low level. During the first ten months of 1915 both series showed a decided upward trend, but weakness then developed in the common stocks, while the preferred stock index moved horizontally. This continued until September 1916, when both indices began a rapid advance. The recovery was short-lived, however, and prices fell throughout 1917. From the end of 1917 until the signing of the armistice the indices rose steadily.

THE PRICE INDICES FOR IRON AND STEEL SHARES COMPARED WITH THOSE FOR OTHER INDUSTRIAL STOCKS

Up to this point we have discussed the prices of industrial stocks as a whole. If sufficient data were available, it would next be desirable to consider the characteristics of various groups of securities, such as the shares of companies engaged in the manufacture of textiles, of iron and steel, or of chemicals. But there was only one class of industrial stocks — those of iron and steel — in which it was possible, over the entire period selected for study, to obtain quotations for a sufficiently large number of securities to make practicable the computation of a group index. The only subdivision which it was feasible to make, then, was one separating the iron and steel shares from other industrial stocks. The twenty companies whose stocks had previously been employed in the construction of our indices for all industrials, which have just been presented, were, accordingly, divided into two groups, composed, respectively, of (1) eight iron and steel companies, and (2) twelve other manufacturing companies. Then for each group a common stock and a preferred stock index were computed. The results appear in Charts II and III.[1]

These charts clearly reveal the general similarity of the indices for iron and steel stocks (Chart II) to the corresponding indices for stocks other than iron and steel (Chart III), and consequently to the corresponding indices for industrial stocks as a whole (Chart I). It is evident that the description of the movements of the averages for all industrials, given in the preceding section, applies equally well to either of the two subordinate groups.

This similarity between the two groups is even more clearly brought out by Charts IV and V. Let us first consider the common stock indices, shown in Chart IV It will be seen that throughout the period 1902–18 the prices of the iron and steel common stocks fluctuated within somewhat wider limits than did those of other industrial common stocks; in all other respects, however, there was a remarkably close correspondence between the cyclical movements of the two series, though it is of course possible to point out months, such as February and March 1905, when minor variations appear.

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[1] The process by which the indices were computed is fully explained on pp. 270–274. Their numerical values are given in Table IV, pp. 275–277.

We shall publish in a later issue of the REVIEW index numbers for the years 1919–21 which are based upon a much more extensive list of securities and a more elaborate classification than it is possible to employ for the period 1902–18, and which are, therefore, more completely representative of the entire industrial field as it exists at the present time. For the reason just stated we are discussing in this article only the movements which took place up to and including the year 1918. However, for the benefit of those who may desire series of stock price averages which extend from 1902 to 1921 and which are based upon a uniform list of securities throughout, the indices have been brought up to date.

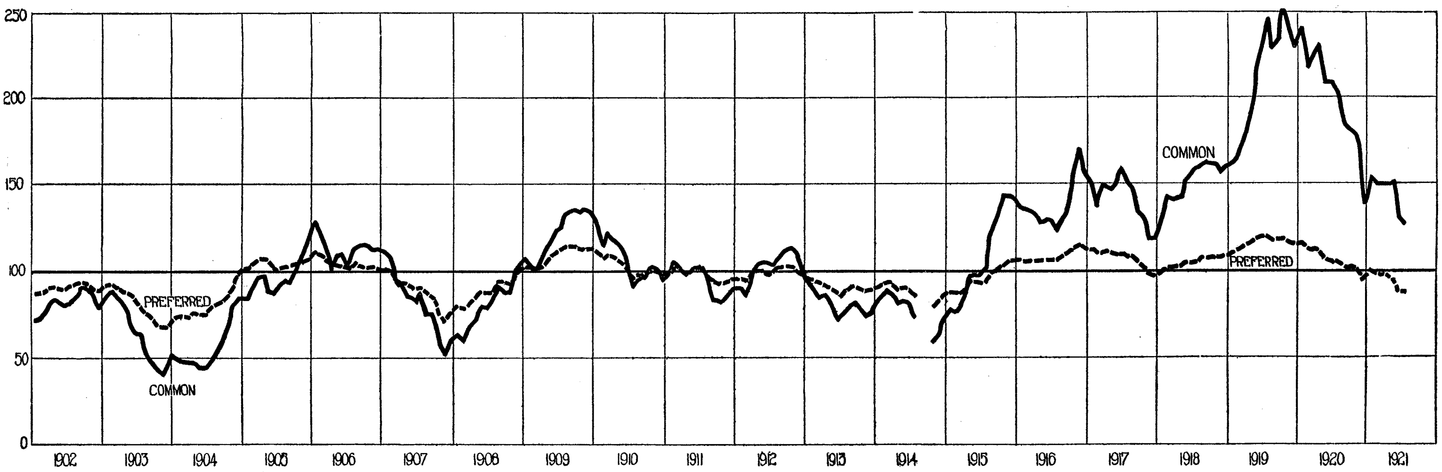

CHART I. — INDEX NUMBERS FOR THE PRICES OF THE COMMON AND THE PREFERRED STOCKS OF TWENTY INDUSTRIAL COMPANIES

(*Base: geometric average for 1909–13 = 100*)

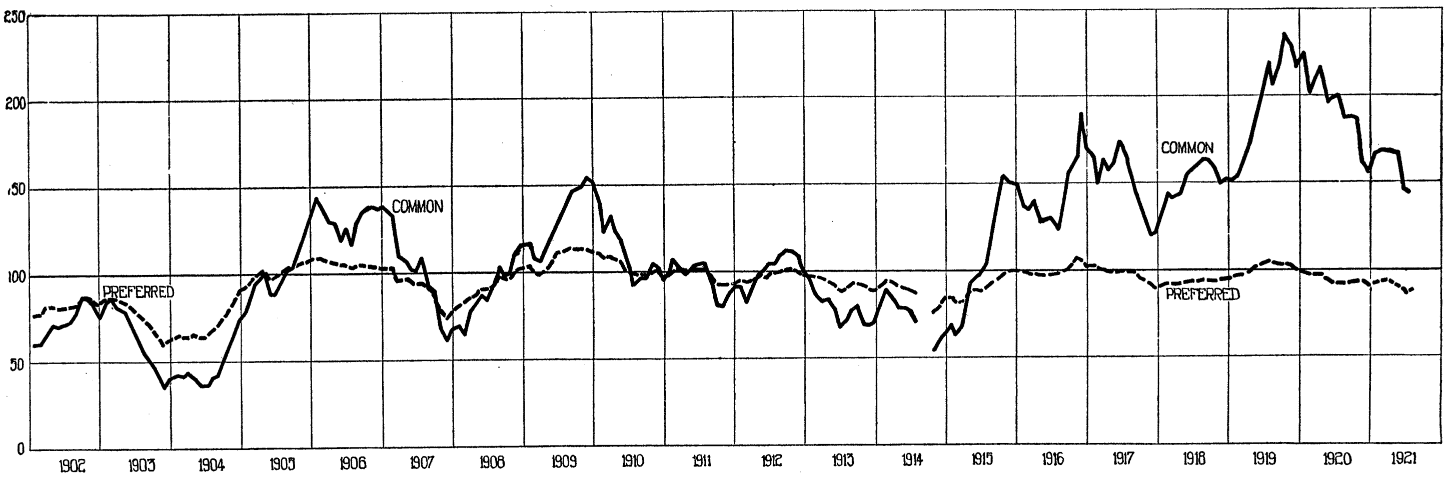

CHART II. — INDEX NUMBERS FOR THE PRICES OF THE COMMON AND THE PREFERRED STOCKS OF EIGHT IRON AND STEEL COMPANIES

(*Base: geometric average for 1909–13 = 100*)

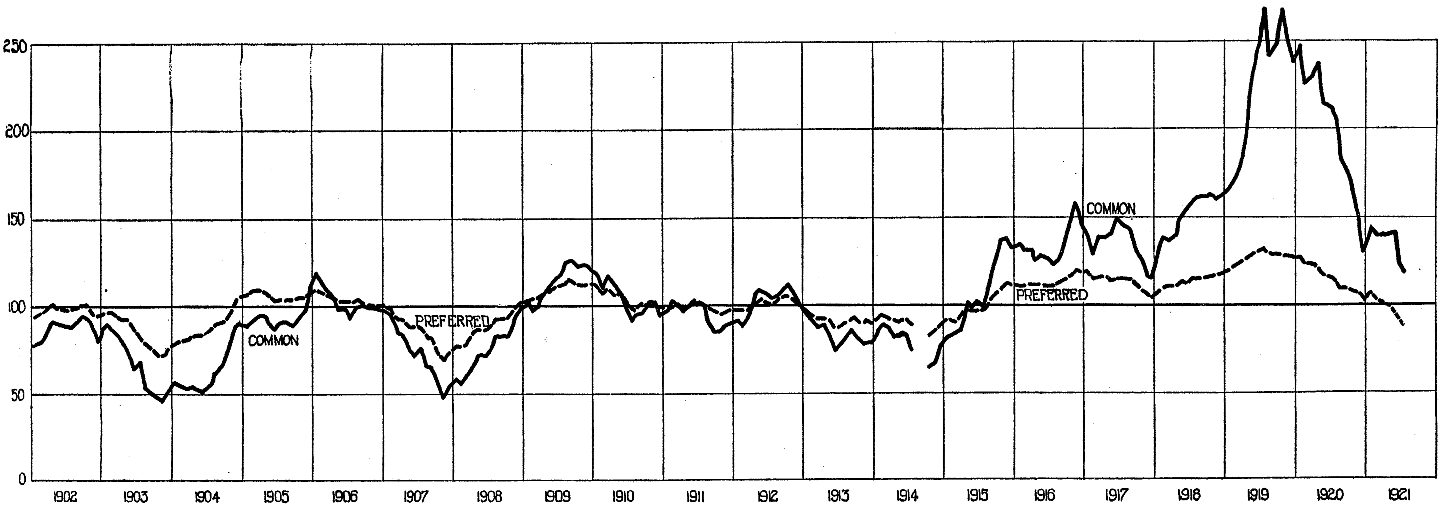

CHART III. — INDEX NUMBERS FOR THE PRICES OF THE COMMON AND THE PREFERRED STOCKS OF TWELVE INDUSTRIAL COMPANIES OTHER THAN IRON AND STEEL

(*Base: geometric average for 1909–13 = 100*)

When we turn to the pair of group averages for preferred stocks (Chart V),[1] we observe that for the prewar period the similarity between their movements is even greater than that between the corresponding averages for the common shares. The preferred indices for the two groups fluctuate with about equal violence and their cyclical movements are in marked agreement. During the years 1902–14 the two series show no divergence of importance other than that in their trends over the period as a whole. The iron and steel preferred stock index gradually rose from 82.3 in July 1902 to 86.4 in July 1914, an increase of 5.0 per cent; between the same dates the index for other preferred stocks fell from 99.2 to 88.5, a decrease of 10.8 per cent.

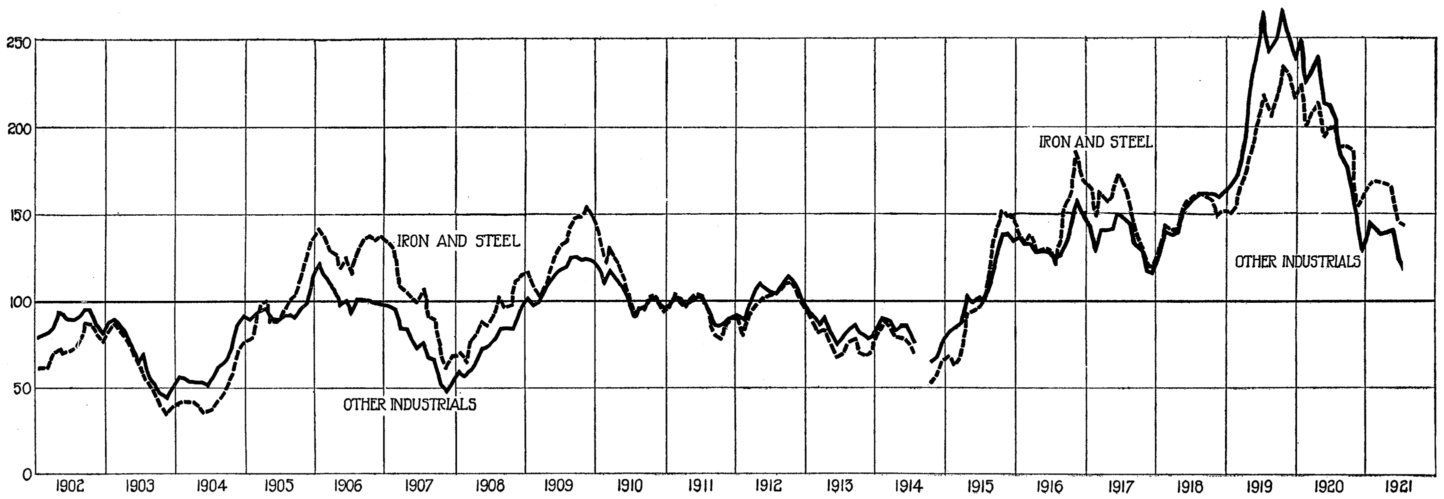

Chart IV. — Index Numbers for the Prices of Eight Iron and Steel Common Stocks and of Twelve Industrial Common Stocks Other than Iron and Steel

(Base: geometric average for 1909–13 = 100)

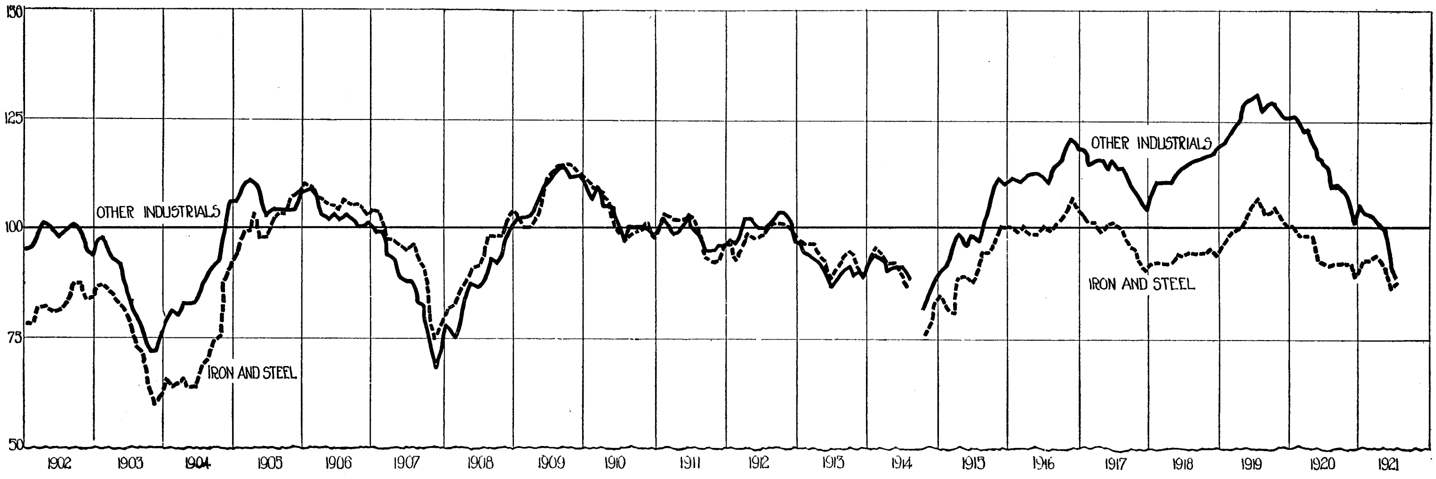

Chart V. — Index Numbers for the Prices of Eight Iron and Steel Preferred Stocks and of Twelve Industrial Preferred Stocks Other than Iron and Steel

(Base: geometric average for 1909–13 = 100)

If now we examine the movements of the preferred averages for the years 1915–18 (Chart V), we see that the two series, while continuing to show fluctuations of similar form, gradually diverged from each other. A study of the dividend records for the securities making up the indices reveals the cause of this discrepancy. Among the twelve stocks included in the group "other than iron and steel" there were two — American Hide and Leather, preferred, and American Linseed, preferred — on which practically no dividends had been paid since the organization of the companies.[2] When in 1916 and 1917, respectively, these stocks began to pay dividends, their prices rose sharply and the increases for the two securities were sufficient to raise the average for the group to a level above that of earlier years. Our iron and steel group, on the other hand, included no preferred stocks which had such decidedly poor dividend-paying records for the period 1902–14, and hence the prosperity of the war years did not cause either the prices of individual stocks or the average for the group to show marked increases over prewar figures.

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[1] In order that the cyclical character of the changes in preferred stock prices might be more clearly shown, this chart has been drawn with a vertical scale twice as large as that used for the other stock index charts published in the present article. That is, the distance which represents 50 points on the other diagrams of pp. 265, 266, and 268 represents only 25 points on Chart V. This difference should be kept in mind when Chart V is compared with Charts I–IV or with Chart VII.

[2] The American Hide and Leather Company was organized in 1899, and from that year until 1918 paid dividends on the preferred stock as follows: 1899–1904, none; 1905, 3 per cent; 1906–15, none; 1916, 5 per cent; 1917, 5 per cent; 1918, 7 per cent.

The American Linseed Company was organized in 1898, and from that year until 1918 paid dividends on the preferred stock as follows: 1898, none; 1899, 5¼ per cent; 1900, 5¼ per cent, 1901–16, none; 1917, 3 per cent; 1918, 7 per cent.

The Correspondence between the Cyclical Movements of the Price Indices for Common and Preferred Stocks

We have just considered the relationships of the two group indices for common stocks to each other and of the two group indices for preferred stocks to each other. We will next compare the variations of common stock prices with those of preferred stock prices. In connection with Chart I (p. 265), we have already noted that while fluctuations in prices are much more violent for common stocks than for preferred, the indices for the two classes of shares agree in their indication of the turning points which mark the beginning and ending of the longer swings in stock quotations. In order to make possible a more definite comparison between the cyclical movements of the common and the preferred indices, "corrected figures" were secured by eliminating the slight upward trend which existed in each case, and then these corrected figures were plotted on scales so determined that the fluctuations of the two series should be of comparable magnitude.[1] The resulting figures appear in Chart VI. Except for the years 1905 and 1906, when the curve for the common stocks rises to a somewhat sharper peak, the two series practically coincide. This close correspondence between them over the period 1902–14 as a whole shows that the quotations for industrial preferred stocks, though fluctuating within comparatively narrow limits, reflect the alternations of prosperity and depression quite as well as do the prices of the corresponding common shares.

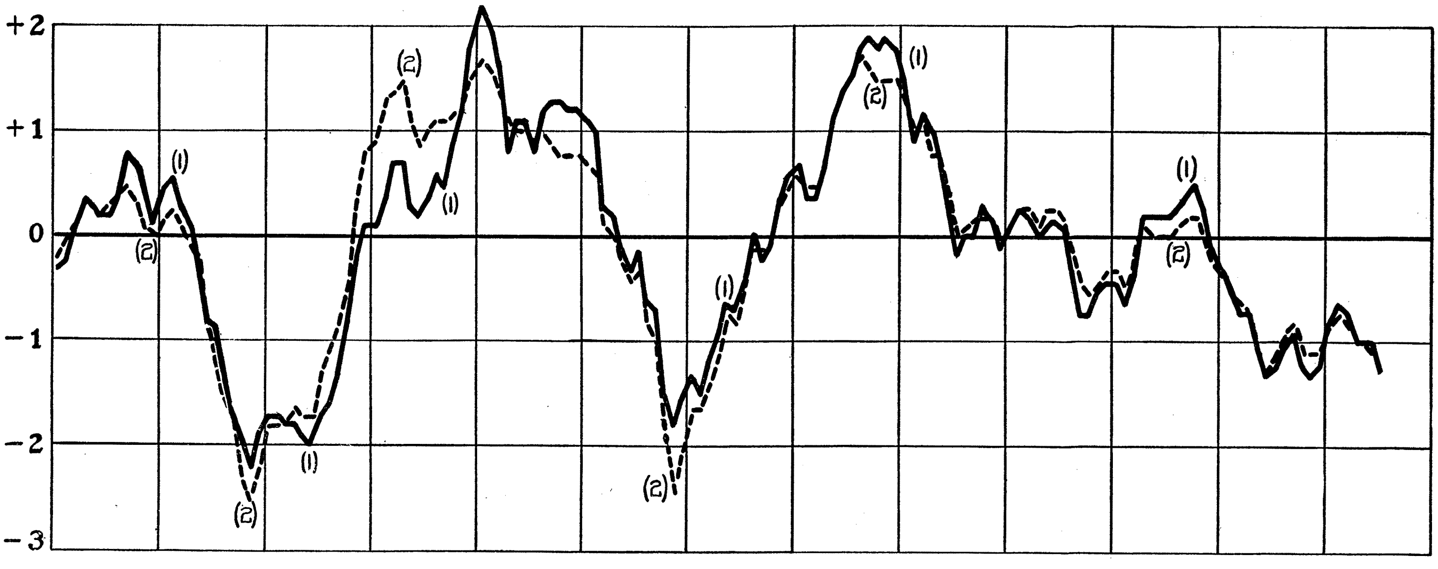

Chart VI. — Comparison of the Cyclical Movements of Index Numbers for the Prices of (1) the Common and (2) the Preferred Stocks of Twenty Industrial Companies

(The long-time trends have been eliminated and the fluctuations of the two series have been reduced to comparable size)

Comparison of Our Index Numbers with Those of the Wall Street Journal

It is of interest to compare our index numbers for the prices of twenty industrial common stocks with the well-known series of industrial stock price averages compiled by Dow, Jones and Co., and published in the *Wall Street Journal.*[2] Since the make-up of the latter series was altered after the reopening of the exchanges in December 1914, it is convenient to discuss separately the pre-war and war periods.[3]

The Pre-War Years, 1902–14

Let us first consider the more important differences in the method of construction of the two series:

(1) The Dow-Jones index is computed by the use of arithmetic averages of actual prices; upon such averages a given percentage change in the quotations of stocks selling at high prices has a much greater effect than an equal percentage change in the quotations of

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[1] The "corrected figures" for series of business statistics are obtained by eliminating from the actual figures the "secular trend," or long-time movement over a period of years, and the seasonal fluctuations to which most trades and business in general are subject. For some series, among which are security prices, no seasonal movement exists and in such cases only the correction for long-time trend is required. The process by which "corrected figures" are secured and the method by which, through the use of the "standard deviation," the fluctuations of the various series are reduced to comparable size, are explained on pp. 4–7 of our circular entitled "The Index of General Business Conditions: a Non-Technical Explanation." They are also set forth in The Review of Economic Statistics for February, 1920, pp. 40, 41. A complete discussion from the technical statistical point of view appears in the Review for January, 1919.

[2] Dow, Jones and Co. present their data in the form of daily averages for the prices of the stocks included in their index. At intervals summary tables are given showing the "high" and "low" prices for each month. The "high" figure is simply the highest daily average occurring in the given month and, similarly, the "low" figure is the lowest daily average in the month. For the period 1902–17, the Review reduced the *Wall Street Journal's* figures to a single series by taking monthly arithmetic means between these monthly "high" and "low" averages. Beginning with January 1918, the monthly averages were secured by taking monthly means of the daily averages. For a complete discussion of the Dow-Jones index see The Review of Economic Statistics for April, 1919, pp. 145–147.

[3] The *Wall Street Journal's* series for the period January 1902 to July 1914 based upon twelve stocks was replaced by a series beginning December 1914 based upon twenty. From December 1914 to October 1916 quotations for both series were available. During this time the fluctuations of the two were similar; the average for the twelve over the 23 months was $108.90, and that for the twenty was $81.60. The ratio of these two averages to each other was $\frac{\$81.60}{\$108.90} = 75.1$ per cent. In order to form a continuous series from the *Wall Street Journal's* figures, their averages based upon twenty stocks were multiplied through by this ratio, beginning with December 1914.

stocks selling at low prices. Our index, which is formed from geometric averages, has the important advantage that equal percentage changes in prices have equal effects, regardless of the level on which quotations are fluctuating.

(2) The list of securities making up our index remains unchanged throughout the period, while a number of substitutions occur in the Dow-Jones list. These substitutions to a certain extent destroy the comparability of their averages for earlier and later years.

(3) The index numbers constructed by the Review are based upon a larger number of securities than are the averages of the *Wall Street Journal*, there being twenty stocks included in the former and only twelve in the latter.

(4) The securities making up our index form a homogeneous group — they are all common stocks of manufacturing companies. The Dow-Jones list, on the other hand, embraces ten common and two preferred stocks, and among the common shares there appear the stocks of one mining company and of one public utility. In Table I is shown a comparison of the securities entering the two indices, the five stocks common to both being indicated by italics.

Table I. — Comparison of Securities Included in (1) Index Numbers for the Prices of Twenty Industrial Common Stocks, Computed by the Review, and (2) the Dow-Jones Averages for the Prices of *Twelve* Industrial Stocks, January 1902 to July 1914, Published by the Wall Street Journal *

(1) *Review*	(2) *Wall Street Journal*
Common Stocks	Common Stocks
Manufacturing:	Manufacturing:
American Car and Foundry	*American Car and Foundry*
American Sugar Refining	*American Sugar Refining*
National Lead	*National Lead*
U. S. Rubber	*U. S. Rubber*
U. S. Steel	*U. S. Steel*
American Agricultural Chemical	American Smelters
American Cotton Oil	Colorado Fuel and Iron
American Hide and Leather	General Electric
American Linseed	Public Utility:
American Locomotive	People's Gas
American Woolen	
Central Leather	Mining:
Corn Products Refining	Amalgamated Copper
National Biscuit	
Pressed Steel Car	Preferred Stocks
Railway Steel-Spring	Manufacturing:
Republic Iron and Steel	U. S. Rubber, first preferred
Sloss-Sheffield Steel and Iron	U. S. Steel, preferred
U.S. Cast Iron Pipe and Foundry	
Virginia-Carolina Chemical	

* As is stated above, a number of substitutions were made from time to time in the *Wall Street Journal's* list. It is here given as it stood during the major part of the period under discussion.

In spite of the important differences in method of construction, however, the two averages, when both have been reduced to the base 1909–13, exhibit surprising similarities over the period we are now considering, 1902–14 (see Chart VII). They agree in showing a slight upward trend during these years; furthermore, their fluctuations exhibit a very close correspondence. Except for minor variations in movement, they differ only in that the Dow-Jones series, possibly on account of the two preferred stocks which it includes, fluctuates somewhat less violently than does the index computed by the Review. The agreement between the cyclical movements of the two indices is even more clearly shown in Chart VIII, where they have been corrected by the elimination of their long-time trends and their fluctuations have been reduced to comparable size.[1]

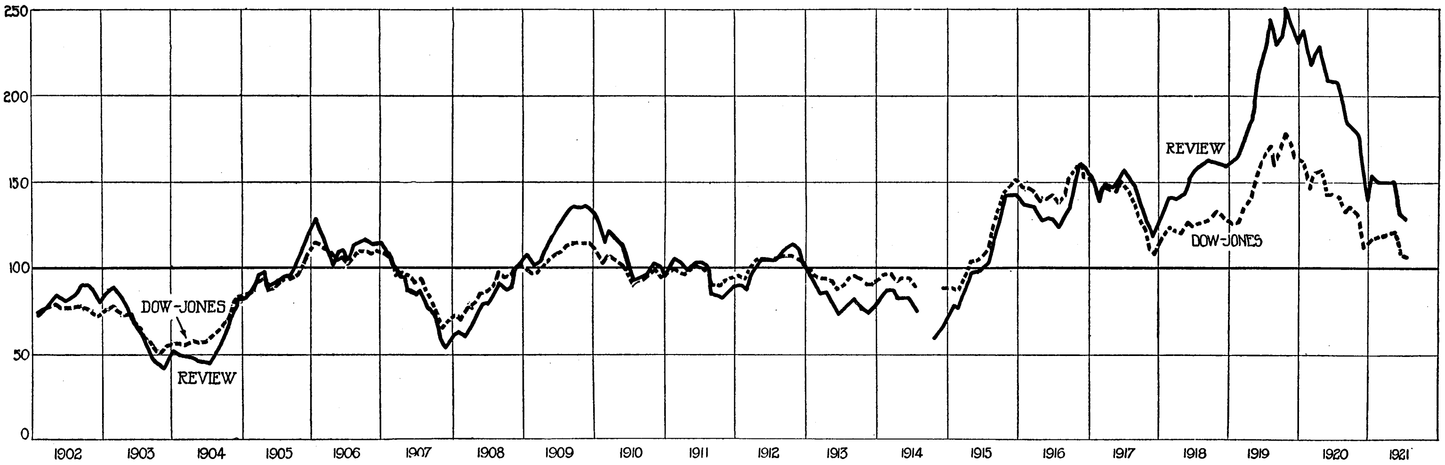

Chart VII. — Comparison of (1) Index Numbers for the Prices of Twenty Industrial Common Stocks, Computed by the Review, and (2) the Dow-Jones Averages for the Prices of Industrial Stocks, Published by the Wall Street Journal

(Both series reduced to the base geometric average for 1909–13 = 100)

The War Years, 1915–18

We may compare the methods of construction of the two series during 1915–18 as follows:

(1) As before, our index is based upon geometric averages and the Dow-Jones index upon arithmetic averages.

(2) In neither index was there any change in the list of securities included.

(3) The number of stocks employed is the same in each case — twenty.

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[1] See footnote 1, p. 267.

(4) Both indices are made up entirely of common stocks. The averages of the REVIEW include only the shares of manufacturing companies; the index of the *Wall Street Journal* is mainly composed of such securities, but it also embraces two copper stocks and two telephone and telegraph stocks. The comparative lists follow, the seven names common to both being italicized:

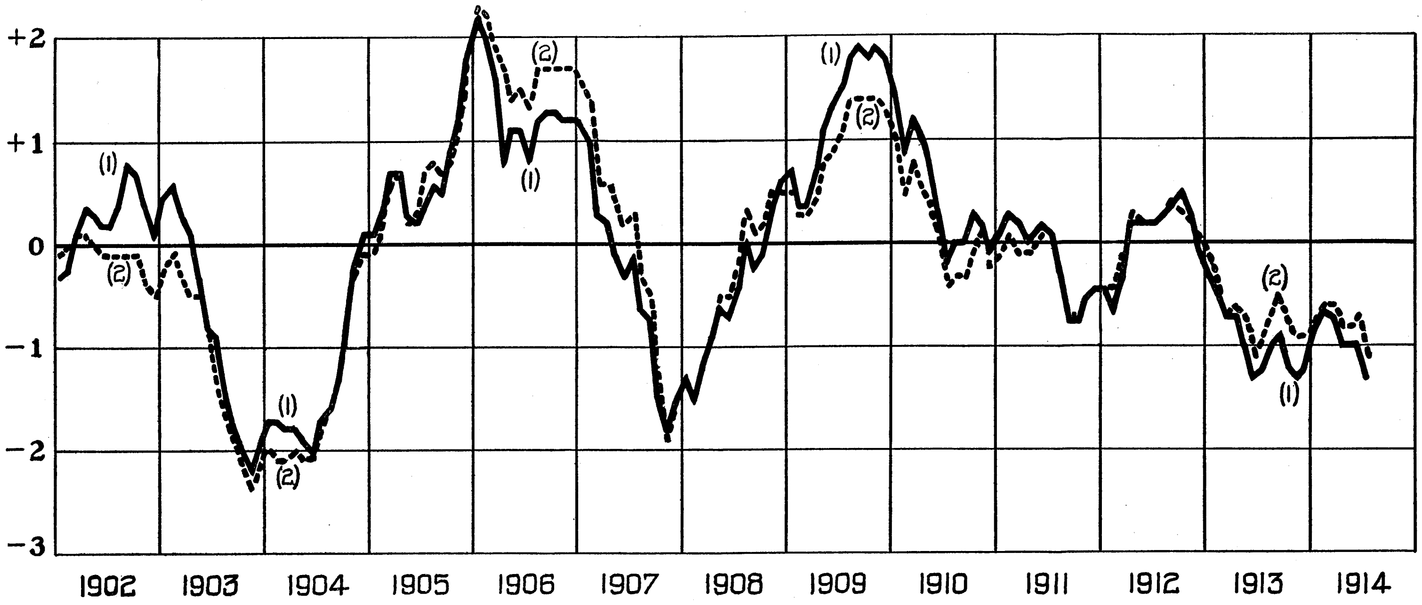

CHART VIII. — COMPARISON OF THE CYCLICAL MOVEMENTS OF (1) INDEX NUMBERS FOR THE PRICES OF TWENTY INDUSTRIAL COMMON STOCKS, COMPUTED BY THE REVIEW, AND (2) THE DOW-JONES AVERAGES FOR THE PRICES OF TWELVE INDUSTRIAL STOCKS, PUBLISHED BY THE WALL STREET JOURNAL

(The long-time trends have been eliminated and the fluctuations of the two series have been reduced to comparable size)

TABLE II. — COMPARISON OF SECURITIES INCLUDED IN (1) INDEX NUMBERS FOR THE PRICES OF TWENTY INDUSTRIAL COMMON STOCKS, COMPUTED BY THE REVIEW, AND (2) THE DOW-JONES AVERAGES FOR THE PRICES OF *Twenty* INDUSTRIAL STOCKS, DECEMBER 1914 TO DECEMBER 1918, PUBLISHED BY THE WALL STREET JOURNAL

(1) *Review* (ALL COMMON STOCKS)	(2) *Wall Street Journal* (ALL COMMON STOCKS)
Manufacturing:	Manufacturing:
American Car and Foundry	*American Car and Foundry*
American Locomotive	*American Locomotive*
American Sugar Refining	*American Sugar Refining*
Central Leather	*Central Leather*
Republic Iron and Steel	*Republic Iron and Steel*
U. S. Rubber	*U. S. Rubber*
U. S. Steel	*U. S. Steel*
American Agricultural Chemical	American Beet Sugar
American Cotton Oil	American Can
American Hide and Leather	American Smelting
American Linseed	Baldwin Locomotive
American Woolen	General Electric
Corn Products Refining	Goodrich
National Biscuit	Studebaker
National Lead	Texas Co.
Pressed Steel Car	Westinghouse
Railway Steel-Spring	Telephone and Telegraph:
Sloss-Sheffield Steel and Iron	American Telephone and Telegraph
U. S. Cast Iron Pipe and Foundry	Western Union
Virginia-Carolina Chemical	Mining:
	Anaconda
	Utah Copper

Though formed from quite different lists of securities, our index and the Dow-Jones averages moved closely together during 1915–17, the first three years of the war period (see Chart VII). In 1918, however, a considerable divergence took place. Our index rose sharply throughout the year, while that of the *Wall Street Journal* showed only a moderate increase. This discrepancy is due to differences in the composition of the two indices. In our list there appear five chemical stocks, whose prices showed an average increase of 60 per cent during the year; the *Wall Street Journal's* average included no chemical stocks. On the other hand, among the securities making up the *Wall Street Journal's* list there were two telephone and telegraph stocks, whose quotations showed a decrease for December 1918 as compared with December 1917, and two copper stocks whose prices increased but slightly over the twelve months; neither of these two classes of shares were represented in our index. These differences in the movements of certain series entering into the averages account for the failure of the latter to move together during 1918.[1]

THE PRICE SERIES IN THE INDEX OF GENERAL BUSINESS CONDITIONS

Our Index Chart of General Business Conditions (Chart IX)[2] is made up of three group indices, each of which is composed of two classes of series — one representing *volume*, the other *price* of (A) securities, (B) commodities, and (C) loans, respectively. For the period 1903–14 the index for *Group A*, *Speculation*, is based upon (1) the volume of speculation, represented by New York City bank clearings, and (2) the prices of bonds and stocks; the index for *Group B, Business,* is based upon (1) the volume of pig-iron production and outside clearings and (2) the wholesale prices of commodities; and the index for *Group C, Banking,* is based upon (1) the volume of credit extended, as indicated by loans and deposits of New York banks, and (2) the price of such credit, as indicated by the rate of interest on commercial paper.[1]

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[1] The divergence between the indices during the years 1919–21 will be considered in a later article.

[2] The methods employed in the construction of the Index are fully explained in the publications to which reference is made in footnote 1, p. 267. The Index Chart for the period November 1918 to date will be found on p. 251 of this issue of the REVIEW.

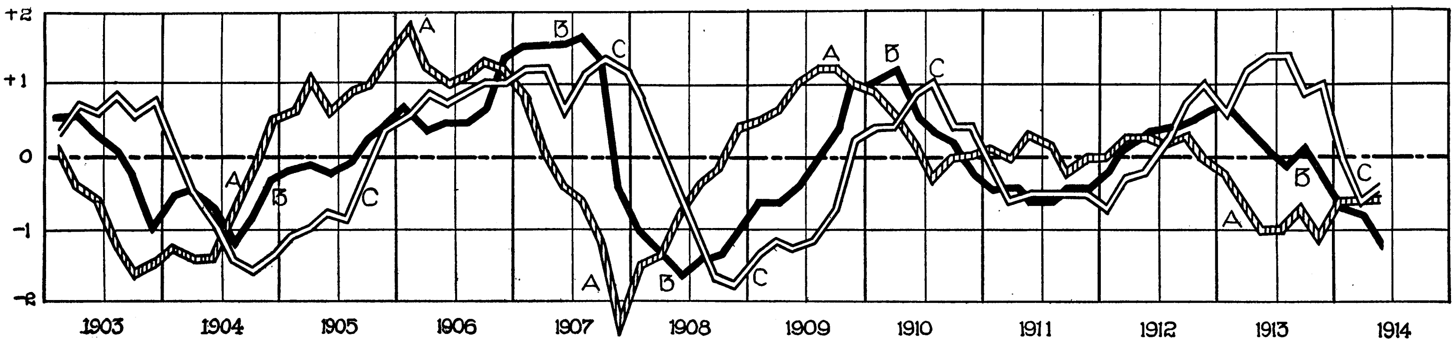

Chart IX. — The Index of General Business Conditions. (A) Speculation: Prices of Securities and Volume of Stock Sales. (B) Business: Wholesale Prices of Commodities and Volume of Business. (C) Banking: Commercial Paper Rates and Bank Loans and Deposits

As Chart IX clearly shows, a definite relationship exists between the movements of the three curves. Their turning points, whether upward or downward, always come in the same order. The turning points in speculation, curve A, precede by a number of months the turning points in wholesale commodity prices and general business activity, as reflected in curve B; and similarly, the turning points in curve B precede by several months the major movements of curve C, banking. In order to determine whether or not the same relationship would appear if the volume series were omitted and price series only were employed, Chart X was constructed. In this chart there is presented a comparison of the corrected figures [2] for three price series, one from each of the groups making up our Index Chart. These series are as follows: from the speculative group (A), the prices of industrial stocks, as indicated by our indices for twenty common stocks; from the business group (B), the wholesale prices of commodities, as indicated by Bradstreet's index; and from the banking group (C), the price of loans, as indicated by commercial paper rates.[1]

It will be seen that the relationships previously found to exist for the curves of our Index Chart also hold, in general, for the corrected figures of the three price series shown in Chart X. The more important movements of industrial stock prices, representing the speculative group, precede those of wholesale commodity prices, representing the business group; and the latter in turn precede the fluctuations in the rate of interest, representing the banking group. This sequence is maintained uniformly throughout with the single exception of the year 1911, when the stock price series was the second to rise, rather than the first.

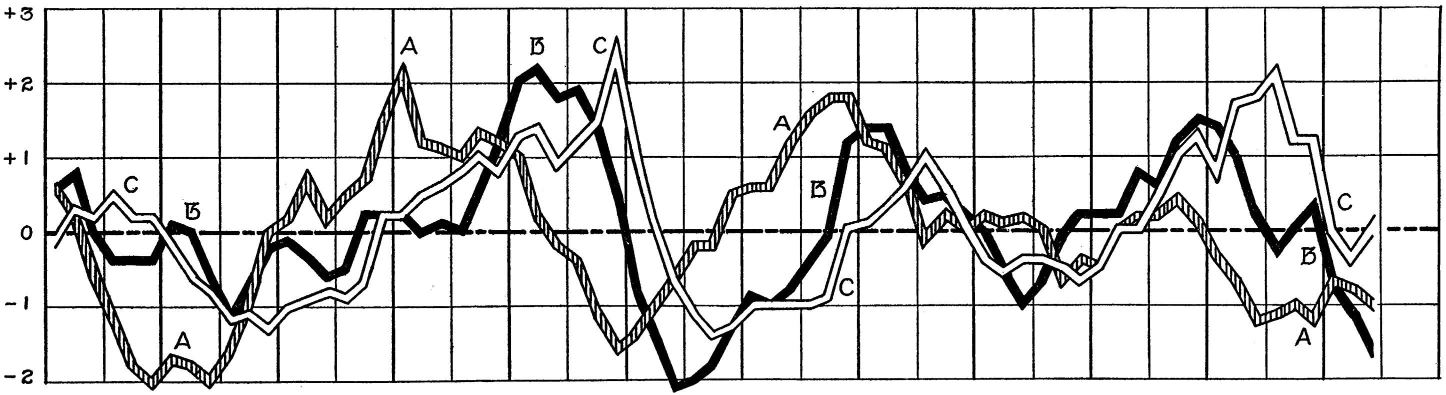

Chart X. — Corrected Figures for (A) Index Numbers of the Prices of Twenty Industrial Common Stocks, Computed by the Review, (B) Bradstreet's Index Numbers of Wholesale Commodity Prices, and (C) Rate of Interest on Commercial Paper in New York City

II. THE METHOD

The Purpose of the Index

In the construction of any index number it is desirable that from the very beginning the use to which that index is to be put should be kept clearly in mind, for at almost every step of the computation questions will arise which can be correctly settled only if the purpose of the index is taken into account. In the case of stock price indices decisions must be made as to what securities are to be included, whether daily, weekly, or monthly quotations shall be taken, what form of average shall be employed, whether or not the index shall be weighted, and, if it is to be weighted, what the criterion of importance shall be. On these points different conclusions will be reached, depending upon whether the index is primarily intended to register the changes in the total money value of a given set of securities, or to show the trend in prices over a considerable period of time, or to serve as a barometer of general speculative conditions. In constructing our indices the purpose was not to measure the aggregate money cost of a selected group of shares or to compare price levels at widely separated dates; we desired, rather, to secure indices representing as accurately as possible those long-time swings, or cyclical movements, in stock prices which indicate the alternation of general speculative activity and depression.

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[1] In both Chart IX and Chart X the figures plotted are bi-monthly averages. [2] See footnote 1, p. 267.

The Data Utilized

Previous to the selection of the data to be used in constructing our indices, a careful study was made of the quotations for individual securities. It would have been too great a task, however, to transcribe and to plot monthly figures for every stock quoted during the period, and for this reason annual data were employed in the preliminary investigation. Poor's *Manuals*[1] give convenient summary tables showing the annual high and low prices since 1902 for all stocks quoted on the New York Stock Exchange and for the more important stocks traded in on other exchanges.

The annual high and low prices, 1902–20, for the stocks (except those of railroads) having complete annual quotations over this period were transcribed and put in graphic form. A comparison of the charts revealed the fact that the various classes of securities which are sometimes grouped together to form indices of "industrial" stock prices differ from each other in the character of their fluctuations. The quotations for the shares of manufacturing companies showed tendencies unlike those of public utility or mining stocks. It was clear, then, that separate indices for these classes would give much more information than would a general index in which non-homogeneous elements were combined. The present study has been confined to the construction of indices for the most important of these classes of stocks — those of manufacturing companies.

In making up the list of securities to be included in the index, two criteria were established:

(1) *Completeness of data.* Only those companies were included for whose common stocks substantially complete monthly high and low quotations were available since 1902.

(2) *Size of corporation.* No organization was included whose total assets at the end of the fiscal year 1910 were less than $20,000,000.

There were twenty-five companies which satisfied both tests. Of these twenty-five, three — the General Electric Company, Swift and Company, and the United Shoe Machinery Corporation — were dropped from the list for the reason that in each case stock dividends repeatedly interrupted the continuity of the quotations, and the task of making the necessary adjustments would have been a considerable one. Two other corporations, the International Paper Company and the Westinghouse Electric and Manufacturing Company, were excluded, the first because of the shift in the price level of its stock produced by the rearrangement of its securities in 1917, and the second on account of the break in quotations brought about by the receivership and reorganization through which the company passed in 1907–08.

The omission of the five corporations just mentioned reduced our list to twenty names, which were divided into two groups, as follows:

Iron and steel:
- American Car and Foundry Co.
- American Locomotive Co.
- Pressed Steel Car Co.
- Railway Steel-Spring Co.
- Republic Iron and Steel Co.
- Sloss-Sheffield Steel and Iron Co.
- United States Cast Iron Pipe and Foundry Co.
- United States Steel Corporation.

Other than iron and steel:
- American Agricultural Chemical Co.
- American Cotton Oil Co.
- American Hide and Leather Co.
- American Linseed Co.
- American Sugar Refining Co.
- American Woolen Co.
- Central Leather Co.
- Corn Products Refining Co.
- National Biscuit Co.
- National Lead Co.
- United States Rubber Co.
- Virginia-Carolina Chemical Co.

It was found that practically complete series of price quotations for preferred stocks of these twenty companies could be secured as well as the quotations for common stocks. Consequently, as we have said, both common and preferred stocks are covered in the present study. For each of the forty securities monthly average prices were obtained by taking arithmetic means between the monthly high and low quotations.[2] If it had

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[1] Our annual data were taken from *Poor's Manual of Railroads*, 1902 and 1920.

[2] The monthly high and low quotations for 1902–18 were taken from the annual issues of the *Financial Review;* those for 1919–21 from the *Commercial and Financial Chronicle.* In general, these quotations represent the prices at which actual sales took place on the New York Stock Exchange. When for a given month there were no transactions in a particular security on the New York exchange the prices from another exchange were employed; if these were lacking, the missing figure was supplied by using the mean of the "bid" and "asked" quotations given in the monthly Bank and Quotation Section of the *Commercial and Financial Chronicle.* When neither sales nor "bid" and "asked" prices were available, the gap was filled in by interpolation (see pp. 274).

The New York Stock Exchange was closed from July 31 to December 12, 1914. No data were available for the months of August and September. Our prices for October and November were taken from the unofficial quotations published in the *Financial Review* for 1915, pp. 157–161.

For the period 1902–17 the Boston Stock Exchange figures were used for American Agricultural Chemical, common and preferred, which during these been our purpose to determine with considerable exactness the month-to-month fluctuations in stock prices, it would have been necessary for us to make our monthly averages from daily, or at any rate weekly, quotations. As has been indicated, however, our primary interest was in the longer movements of stock prices which are indicative of the changes in general speculative conditions, and these movements could be measured with amply sufficient accuracy by the use of the high and low prices for each month.

ADJUSTMENTS

Throughout the period 1902–21 there were a number of cases in which, because of a change in status of a given stock, the prices for that security abruptly shifted to a new level, and it was necessary to make an adjustment in the quotations. These changes in quotations, resulting from other than "market" causes, were of three kinds — those brought about by (*a*) reorganizations, (*b*) stock dividends, and (*c*) stock subscriptions at favorable rates.

(*a*) *Reorganizations.* The method of adjusting the quotations for reorganizations will be illustrated by the case of the United States Leather Company, which was succeeded in 1905 by the Central Leather Company. The prices of the stocks for July 1905, the month in which quotations for Central Leather first appeared on the New York Stock Exchange record, were:

	High	Low	Mean of high and low
Common stocks:			
Central Leather.......	47	41½	44.25
United States Leather .	13⅜	12½	12.94
Preferred stocks:			
Central Leather.......	105½	103½	104.50
United States Leather .	111½	108⅞	110.19

In this month during which the quotations for the shares of the companies overlapped, then, the mean price of Central Leather, common, bore to the mean price of United States Leather, common, the ratio $\frac{44.25}{12.94}$ = 342 per cent. Hence, the adjustment was made by multiplying the quotations for the latter stock, January 1902–June 1905, by 342 per cent. For the preferred stock the adjustment factor was $\frac{104.50}{110.19} = 94.8$ per cent.

(*b*) *Stock dividends.* As an example we will consider the stock dividend of 33⅓ per cent paid to the common shareholders of the Sloss-Sheffield Steel and Iron Company in October 1905. The payment of this dividend did not, of course, change the value of the properties owned by the corporation; its effect was to increase, in the ratio $\frac{133\frac{1}{3}}{100}$, or $\frac{4}{3}$, the number of shares into which the ownership of those properties was divided and thereby to decrease, in the ratio $\frac{100}{133\frac{1}{3}}$, or $\frac{3}{4}$, the value of each share. Hence, the quotations prior to September 20, 1905, the date on which the security was first quoted "ex-stock-dividend," were multiplied by ¾, or 75 per cent,[1] in order to make those quotations comparable with subsequent figures.

(*c*) *Stock subscriptions at favorable rates.* The only case in which the granting of subscription rights to stockholders at a rate below the market price brought about a decided break in quotations was that of the United States Rubber Company in 1919. In September of that year all common shareholders were given the right to subscribe for 100 per cent additional stock at par. In other words, each common shareholder had the privilege of buying from the company, at the price of $100 a share, a number of shares equal to that which he already held.

On September 11, 1919, the last day before the stock was quoted "ex-rights" on the New York Stock Exchange, the prices of United States Rubber, common, were as follows:

High	Low	Mean of high and low
130½	124	127.25

If we assume $127.25, the mean of these high and low prices, to be a reasonably close approximation to the market value of one share of the stock just before the security was quoted "ex-rights," what followed may be thought of in this way:

If the owner of a single share of stock surrendered to the company that share (the market value of which we have just estimated to be $127.25) together with $100.00 in cash, the combined worth of the share and the money payment being $127.25 + $100.00 = $227.25, he would receive in return two shares of stock, each one of which, then, might be expected to show a market value of $\frac{1}{2} \times \$227.25 = \$113.62$.[2]

Now if we take $127.25 and $113.62, respectively, as approximations to the market value of one share just before and just after the right to subscribe expired, we secure the ratio $\frac{113.62}{127.25} = 89.3$ per cent, as the factor by which quotations prior to September 12, 1919 should be multiplied.

There were a number of other companies whose shares were from time to time offered to stockholders at rates below the market price. In all other instances, however, both the theoretical correction and the actual change in quotations were so slight that it was clearly not worth while to make any adjustment.

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years were quoted with somewhat greater regularity there than on the New York Stock Exchange.

The preferred stock quotations employed for United States Rubber were, of course, those for the first preferred.

[1] The quotations for September 19 and 20, 1905 were as follows:

	High	Low	Mean of high and low
September 19, 1905	93½	92⅞	93.18
September 20, 1905	71¼ *	68¾ *	70.00 *

* Ex-stock-dividend.

The mean price of September 20 bore to the mean price of September 19 the ratio $\frac{70.00}{93.18} = 75.1$ per cent, corresponding very closely with the theoretical figure of 75.0 per cent.

[2] On September 12, 1919, when United States Rubber, common, was first quoted "ex-rights," the mean of the high and low prices was 113.88, a very close agreement with this theoretical figure.

METHOD OF AVERAGING

After such adjustments as were required had been made in the quotations, it was next necessary to decide upon the process to be employed in combining the prices for the different stocks to form indices. The number of items was so small as to make the use of the median impracticable. The choice of method, then, lay between the use of geometric means, on the one hand, and of aggregates [1] or arithmetic means, on the other. Aggregates and arithmetic means are superior to geometric means as measures of the changes in the total amount of money that a given set of stocks or commodities cost; but geometric means are better measures of the average percentage of change in prices over a period of time.[2] In the problem now under consideration we were primarily interested in the average relative changes in stock prices rather than in the aggregate money cost of a group of securities; consequently the geometric mean was considered the better type of average for our purpose.

The next questions to be settled were whether or not this geometric mean was to be weighted, and if so, what the basis of weighting should be. The answer to these questions obviously depended upon the purpose for which the index was to be constructed. In his article entitled "A Critique of Index Numbers of the Prices of Stocks," Professor Wesley C. Mitchell, discussing this point, says: "If the aim is to show the average changes in the prices of securities held by the public, the amount of stock outstanding yields the logical set of weights. If the aim is to throw light on the changes in the prices of business enterprises as such, then gross earnings, the best available gauge of the volume of business transacted, may be used as weights. If the aim is to find the average changes in the prices of stocks that are traded in, then the number of shares sold should be used." [3]

But in constructing our index numbers it was not our object to do any of these things. As has already been stated, we wished rather to obtain an index which should represent the effect of those influences which brought about the long-time swings, or cyclical movements, in security prices. Consequently, if the stocks were to be weighted at all, they should have been weighted according to their values as indicators of general speculative conditions. An examination of the price charts for the various stocks showed remarkable agreement in the indication of the turning points in industrial stock prices. Over the period chosen for study there appeared to be little ground for a selection of some stocks as being superior to others for the purpose of measuring general speculative activity. Consequently it was decided that our index numbers should not be weighted.

In order, however, to determine the extent to which a weighted and an unweighted index number would differ from each other, a test was made. The data employed for this experiment were the prices of the twenty common stocks for November of each year, 1902–20. This particular month was selected after the charts for the individual stocks had been carefully examined and it had been found that nearly all of the important turning points in quotations had occurred either in November or in one of the two months, October and December, which lie nearest November, and consequently the figures for successive Novembers would show better than those for any other month of the year the longer swings of industrial stock prices.

For the data selected two index numbers were calculated. The first was an unweighted geometric mean. The second was a weighted geometric mean computed in the manner which will now be described.

The twenty stocks were divided into manufacturing groups, the classification of the United States Bureau of the Census being adopted. These groups, together with the number of securities included in each, were as follows: [4]

Food and kindred products	3
Textiles and their products	1
Iron and steel and their products [5]	6
Leather and its finished products	2
Chemicals and allied products	5
Vehicles for land transportation [5]	2
Miscellaneous	1

For each of these seven classes an index number was computed by taking geometric means of the prices of the securities included. Since it was impossible within any given group to determine the relative value of the stocks as indicators of speculative conditions for that group, these geometric means were not weighted.

In combining these averages to form a single index for industrial stocks as a whole, the different groups were weighted according to "value added by manufacture" in 1909 as reported by the Bureau of the Census. The "value added by manufacture" represents probably better than any other available figure the relative importance of the various industrial groups; in particular, 1909 was selected as the basis of weighting for the reason that it was the most recent census year for which data were at the same time fully obtainable and unaffected by the war.[6]

Chart XI shows a comparison of the weighted and the unweighted index numbers for the prices of the twenty common stocks. It will be observed that for the period

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[1] Professor Irving Fisher's "ideal index number" may be regarded as a special case of the index based on aggregates, for his process is (1) to compute two index numbers both based on aggregates but differently weighted, and then (2) to take a mean (the geometric) between these two indices, thus obtaining a single figure. A complete discussion of Professor Fisher's formula will be found in THE REVIEW OF ECONOMIC STATISTICS for May, 1921, pp. 103–113.

[2] As compared with arithmetic means of relative prices, geometric means have the further advantage that the latter can readily be shifted from one base period to another and the former cannot.

[3] *Journal of Political Economy*, July, 1916, p. 687.

[4] Only seven of the Census Bureau's fourteen groups were represented in our list of twenty stocks.

[5] The eight securities which we, in our broader classification (p. 271), designated as "iron and steel stocks" are here subdivided under the two headings "iron and steel and their products" and "vehicles for land transportation."

[6] The weights here employed in combining the group indices of stock prices are the same as those used by Dr. E. E. Day in computing his index numbers of physical production for manufacture. See THE REVIEW OF ECONOMIC STATISTICS for November, 1920, pp. 322, 323.

1902–18[1] the two curves exhibit marked agreement, except that in November 1902 the weighted index is somewhat lower than the unweighted and in November 1905 the reverse is true. So far as the indication of cyclical movements in stock prices is concerned, however, these differences are not of importance. It is evident that had we computed weighted instead of unweighted means our conclusions would not have been modified. Furthermore, for the particular purpose of constructing an industrial stock index over the pre-war and war periods, it is doubtful whether the weighted mean is logically superior to the unweighted, for the number of securities which fall in the various census groups is in most cases so small as to make the process of computing indices for those groups one of questionable validity.

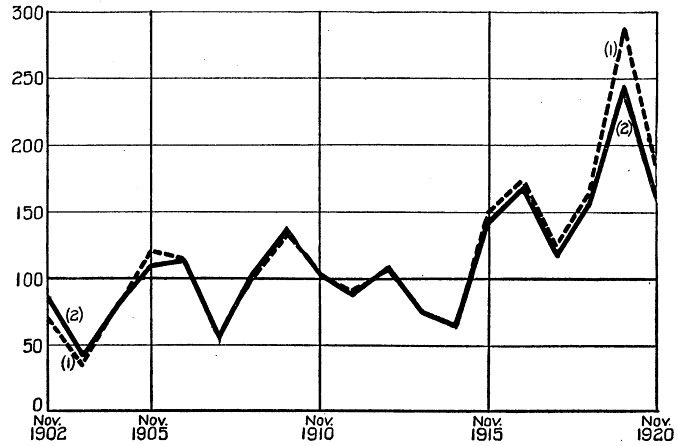

Chart XI. — Comparison of (1) Weighted and (2) Unweighted Index Numbers of the Prices of Twenty Industrial Common Stocks, for November of Each Year, 1902–20

(Base: geometric average of November items for 1909–13 = 100)

Interpolations

When neither sales quotations nor "bid" and "asked" prices were available for a particular security in a given month, an interpolated figure was computed to fill the gap. Table III illustrates the method employed. The case taken is that of American Cotton Oil, preferred, one of the twelve securities previously chosen to make up the preferred group index for the stocks "other than iron and steel" (see p. 271). In the months of January and February 1920 no quotations were available for the stock just named. Interpolated figures were secured by assuming that had American Cotton Oil, preferred, been traded in during these months its price would have changed in the same ratio as did the geometric average price for the other eleven stocks of this group.

But different interpolated values might be obtained by this method. If we began with December 1919 and worked forward, we found that for the other eleven preferred stocks of the group prices in January 1920 bore on the average the ratio $\frac{108.22}{108.07} = 100.14$ per cent to prices in December 1919. Assuming the same percentage change for American Cotton Oil, preferred, we secured as its interpolated price for January 1920, 100.14 per cent of its price in December 1919, or 100.14 per cent of 89.00 = 89.12. If, on the other hand, we began with March 1920 and worked backward, we found that for the eleven stocks the average price in January was $\frac{108.22}{104.99} = 103.08$ per cent of the average price for March. Applying this percentage to the March price for American Cotton Oil, preferred, we secured 103.08 per cent of 85.50 = 88.13 as the interpolated figure for January. We thus had two values — 89.12 and 88.13 — for the interpolated price of American Cotton Oil, preferred, in January 1920, one obtained by working forward and the other by working backward. Since the two processes were equally valid, there was no reason for choosing one result rather than the other, and the geometric mean between them, 88.62, was taken as our interpolated figure for January.

Table III. — Illustration of the Method of Interpolation for Missing Figures

	December 1919	January 1920	February 1920	March 1920
Geometric average price for the preferred stocks of the group "other than iron and steel," excluding American Cotton Oil, preferred	108.07	108.22	105.41	104.99
Average price for American Cotton Oil preferred	89.00	No quot'n	No quot'n	85.50
Interpolated prices for American Cotton Oil, preferred:				
Figure secured by interpolating forward	....	89.12	86.81	....
Figure secured by interpolating backward	....	88.13	85.84	....
Geometric mean of the two preceding figures..............	....	88.62	86.32	....

The February item was secured by a process similar to that just described.

Computation of the Index Numbers

After the unweighted geometric mean had been decided upon as the form of average to be employed and all missing items had been supplied by interpolation, six sets of index numbers were computed, as follows:[2]

(1) For the eight iron and steel common stocks.
(2) For the twelve other common stocks.
(3) For the twenty common stocks combined.
(4) For the eight iron and steel preferred stocks.
(5) For the twelve other preferred stocks.
(6) For the twenty preferred stocks combined.

In each of the six cases the indices were obtained by (*a*) taking unweighted geometric means of the actual monthly prices and (*b*) reducing these means to relative numbers with their geometric average, 1909–13, as the base. The indices thus secured are presented graphically on pages 265, 266 and their numerical values are given below in Table IV.

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[1] The problem of constructing weighted indices for the years 1919–21 will be considered in a later article.

[2] See p. 271 for a list of the companies included in each group.

TABLE IV. — INDEX NUMBERS FOR THE PRICES OF

(1) Eight iron and steel common stocks
(2) Twelve other industrial common stocks
(3) Twenty industrial common stocks
(4) Eight iron and steel preferred stocks
(5) Twelve other industrial preferred stocks
(6) Twenty industrial preferred stocks

(Geometric average for 1909–13 = 100) *

	(1)	(2)	(3)	(4)	(5)	(6)
1902						
January ...	61.1	79.8	71.8	77.8	94.7	87.5
February ..	61.8	80.8	72.6	78.2	96.3	88.7
March	68.3	85.0	77.9	81.5	98.5	91.4
April	71.5	92.8	83.6	81.9	101.0	92.9
May	69.9	90.3	81.6	81.2	99.5	91.8
June	70.9	88.2	80.9	81.4	98.3	91.1
July	72.0	88.7	81.5	82.3	99.2	92.0
August	77.5	90.5	85.0	83.6	99.8	93.0
September .	86.5	95.9	92.1	86.6	100.8	94.8
October ...	85.4	94.2	90.5	86.8	98.5	93.5
November .	82.1	86.6	84.9	84.4	95.2	90.8
December .	77.2	81.6	79.9	83.6	94.2	89.9
1903						
January ...	84.4	88.4	86.8	86.0	96.7	92.3
February ..	87.0	90.4	89.1	87.4	97.6	93.4
March	82.3	85.2	84.1	86.0	95.0	91.2
April	79.2	81.3	80.6	85.2	92.6	89.6
May	73.5	74.6	74.3	83.2	92.1	88.7
June	66.3	65.3	65.8	80.7	87.8	84.8
July	57.2	68.6	63.8	76.6	80.7	79.2
August	52.3	55.1	53.9	73.2	77.9	76.1
September .	46.8	51.9	49.9	70.8	76.4	74.2
October ...	39.9	47.6	44.3	64.5	72.5	69.3
November .	35.0	45.4	40.9	60.2	72.4	67.2
December .	39.4	51.2	46.0	62.3	75.0	69.7
1904						
January ...	41.7	56.6	50.1	65.6	78.9	73.3
February ..	41.4	55.0	49.1	64.2	80.6	73.6
March	42.7	53.4	48.9	64.8	80.5	73.7
April	40.3	54.6	48.5	65.8	83.1	75.8
May	36.5	53.4	45.9	64.0	82.7	74.7
June	36.5	52.0	45.1	64.4	82.5	74.7
July	40.9	56.4	49.6	68.8	86.5	79.0
August	43.0	61.0	53.1	70.5	89.0	81.1
September .	49.2	65.0	58.1	74.4	90.7	83.7
October ...	58.5	74.0	67.3	79.8	93.2	87.5
November .	69.4	85.4	78.7	87.2	100.1	94.7
December .	75.1	91.0	84.2	91.5	106.0	100.0
1905						
January ...	78.3	89.2	84.8	93.6	106.4	101.2
February ..	90.6	92.8	91.9	98.0	109.4	104.8
March	97.9	95.2	96.1	99.4	111.1	106.3
April	100.5	96.6	98.1	102.6	109.4	106.8
May	88.1	89.8	89.2	97.8	106.8	103.2
June	88.1	88.4	88.2	98.5	102.9	101.1
July	94.9	91.2	92.7	101.1	103.8	102.7
August	100.5	92.2	95.5	103.1	103.7	103.4
September .	102.5	90.0	94.8	103.3	103.7	103.6
October ...	114.0	95.4	102.3	106.0	104.1	104.8
November .	123.2	99.8	108.4	106.7	104.1	105.1
December .	134.5	113.1	121.2	108.0	107.8	107.7
1906						
January ...	142.5	120.2	128.4	109.9	109.2	109.5
February ..	137.4	116.6	124.5	108.7	108.7	108.7
March	129.2	111.1	118.0	107.3	106.7	106.9
April	127.5	106.4	101.9	106.4	104.3	105.2
May	119.6	99.9	107.3	105.3	102.4	103.7
June	124.4	100.2	109.2	105.3	102.7	103.7
July	117.9	94.7	103.3	103.8	101.5	102.5
August	129.6	101.1	111.5	105.8	102.9	103.9
September .	135.2	101.6	113.9	105.3	101.5	103.0
October ...	137.8	100.3	113.9	104.6	100.8	102.2
November .	135.1	99.0	112.0	104.4	100.5	102.1
December .	137.5	98.3	112.5	103.3	100.8	101.8
1907						
January ...	134.8	97.4	110.9	103.5	99.3	101.2
February ..	130.5	95.2	107.9	102.9	99.0	100.6
March	108.9	84.2	93.4	96.9	93.8	94.9
April	106.3	84.2	92.6	97.2	92.8	94.5
May	101.6	78.2	86.8	96.5	89.4	92.2
June	100.4	72.9	82.8	94.7	87.6	90.5
July	106.7	76.0	87.1	95.8	88.2	91.1
August	91.6	66.5	75.7	92.8	83.2	86.9
September .	89.1	65.8	74.3	90.0	81.9	85.1
October ...	69.4	53.0	59.0	79.8	73.4	76.0
November .	60.8	47.7	52.7	74.7	68.5	70.9
December .	67.4	54.2	59.0	78.2	73.0	75.0
1908						
January ...	69.6	58.7	62.7	81.5	77.7	79.2
February ..	64.7	56.0	59.3	82.3	76.1	78.6
March	76.6	60.0	66.2	85.2	78.1	80.8
April	81.8	65.6	71.7	87.0	83.1	84.6
May	87.5	72.2	78.0	90.7	86.8	88.3
June	85.3	72.9	77.6	90.7	85.8	87.6
July	93.0	77.7	83.5	93.6	88.5	90.7
August	102.8	84.8	91.8	98.5	92.8	95.2
September .	96.9	83.0	88.3	97.6	92.3	94.4
October ...	98.7	83.6	89.4	97.6	92.9	94.7
November .	111.9	93.2	100.3	101.1	97.8	99.1
December .	116.1	98.4	105.0	102.9	100.5	101.6
1909						
January ...	116.5	102.0	107.6	103.3	102.2	102.7
February ..	106.1	98.8	101.7	100.5	102.9	101.9
March	103.8	100.4	101.9	99.6	103.4	101.9
April	111.3	107.0	108.8	102.4	105.0	104.0
May	121.3	112.8	116.1	106.7	108.2	107.7
June	129.5	117.7	122.4	111.0	110.5	110.6
July	134.8	119.0	125.0	112.8	111.8	112.2
August	144.2	125.0	132.2	114.3	114.2	114.1
September .	146.0	126.8	133.9	113.4	113.6	113.5
October ...	148.7	124.2	133.3	113.8	111.8	112.4
November .	153.4	124.2	135.0	113.4	111.6	112.2
December .	151.5	123.5	134.0	112.3	112.0	112.1

* These averages were: (1) $38.62; (2) $34.38; (3) $36.02; (4) $96.95; (5) $84.25; (6) $89.10.

TABLE IV. — INDEX NUMBERS FOR THE PRICES OF

(1) Eight iron and steel common stocks
(2) Twelve other industrial common stocks
(3) Twenty industrial common stocks
(4) Eight iron and steel preferred stocks
(5) Twelve other industrial preferred stocks
(6) Twenty industrial preferred stocks

(Geometric average for 1909–13 = 100)

	(1)	(2)	(3)	(4)	(5)	(6)
1910						
January ...	138.9	119.0	126.5	110.9	110.3	110.4
February ..	122.4	110.0	114.9	108.6	106.6	107.4
March	130.0	117.7	122.4	109.2	108.9	109.2
April	122.5	112.0	116.2	107.3	105.3	106.1
May	117.6	109.6	112.8	106.3	105.0	105.5
June	105.3	101.2	102.6	101.4	101.7	101.6
July	91.1	92.5	92.1	98.2	97.1	97.6
August	95.6	96.5	96.1	98.2	99.8	99.3
September .	95.4	97.2	96.5	98.7	100.1	99.5
October ...	102.6	102.4	102.3	99.8	100.1	100.1
November .	101.6	102.0	101.8	101.1	99.8	100.3
December .	93.8	96.2	95.3	98.5	98.3	98.3
1911						
January ...	98.7	98.5	98.6	99.4	98.8	99.0
February ..	104.6	103.4	103.9	102.8	101.7	102.0
March	100.8	101.6	101.3	102.3	100.5	101.2
April	97.9	98.8	98.5	101.8	98.8	99.9
May	101.0	100.4	100.7	102.3	100.5	101.2
June	103.3	103.1	103.1	102.8	101.7	102.0
July	102.0	101.2	101.6	101.5	100.5	101.0
August	92.2	93.9	93.3	98.0	97.8	97.9
September .	80.0	86.4	83.8	93.0	95.2	94.3
October ...	78.7	85.8	82.8	91.5	94.7	93.4
November .	85.2	88.8	87.3	93.2	95.8	94.7
December .	90.1	90.4	90.3	95.7	96.0	96.1
1912						
January ...	89.6	92.4	91.2	95.8	97.0	96.5
February ..	80.8	89.6	86.1	92.9	95.8	94.6
March	88.3	97.3	93.7	95.3	98.5	97.3
April	97.9	107.7	103.8	97.8	101.7	100.1
May	100.2	109.9	105.8	97.2	102.0	100.0
June	102.9	107.7	105.7	98.1	100.5	99.7
July	103.4	105.8	104.8	97.2	100.5	100.0
August	107.2	106.8	107.1	100.8	101.2	101.2
September .	110.8	110.6	110.6	101.3	103.1	102.3
October ...	110.8	113.5	112.4	101.3	103.1	102.3
November .	107.6	107.9	107.5	99.8	100.8	100.6
December .	98.4	100.4	99.5	98.2	97.3	97.6
1913						
January ...	93.8	95.2	94.7	97.2	96.0	96.5
February ..	86.5	91.8	89.5	96.0	94.0	94.8
March	81.4	87.8	85.0	95.6	92.6	93.7
April	82.6	89.0	86.4	94.0	92.3	93.0
May	77.2	82.0	80.1	91.5	90.1	90.7
June	66.5	75.3	71.8	88.6	85.6	86.9
July	69.9	79.1	75.2	90.6	88.5	89.6
August	75.6	83.1	80.0	93.2	90.1	91.4
September .	78.2	86.1	82.8	93.9	91.3	92.2
October ...	69.4	81.2	76.2	91.5	88.6	89.8
November .	67.8	79.2	74.5	89.0	90.4	89.8
December .	69.4	79.0	75.1	88.9	89.3	89.1
1914						
January ...	81.4	86.8	84.6	92.5	92.3	92.2
February ..	88.0	90.6	89.7	95.2	93.2	94.0
March	85.5	88.4	87.3	94.0	92.3	93.0
April	79.0	83.6	81.8	91.3	90.0	90.6
May	78.7	84.6	82.2	91.5	90.9	91.1
June	77.2	84.4	81.6	89.4	91.0	90.4
July	69.9	76.2	73.8	86.4	88.5	87.8
August * ...	...	...	...	...	...	...
September *	...	...	...	...	...	...
October * ..	53.1	65.4	60.2	76.5	82.3	79.9
November *	57.5	67.2	63.1	78.6	84.6	82.5
December .	64.3	77.0	71.7	83.2	88.3	86.2
1915						
January ...	67.8	82.9	76.6	84.8	90.4	88.2
February ..	62.6	84.8	75.3	81.4	90.8	87.0
March	66.3	86.8	78.0	81.2	92.6	87.8
April	92.2	102.2	98.2	88.6	97.8	93.9
May	94.3	100.6	98.1	89.6	96.5	93.8
June	95.8	102.2	99.8	87.6	97.6	93.6
July	102.6	100.2	101.1	90.3	97.1	94.4
August	121.7	113.6	116.8	93.5	101.2	98.1
September .	139.0	124.3	130.0	94.5	104.5	100.3
October ...	152.6	138.2	143.8	97.1	108.9	104.1
November .	149.1	139.2	143.2	100.1	111.0	106.5
December .	148.6	135.8	140.8	100.1	110.2	106.1
1916						
January ...	136.0	136.0	135.9	100.1	110.7	106.4
February ..	133.2	133.6	133.4	99.2	110.5	105.8
March	137.2	133.2	134.8	99.8	111.0	106.5
April	126.3	128.5	127.6	98.3	111.8	106.2
May	127.6	129.0	128.5	98.5	112.3	106.6
June	128.6	127.9	128.2	99.6	111.3	106.5
July	121.2	124.2	122.9	99.2	110.2	105.8
August	132.8	126.8	129.1	100.1	112.7	107.6
September .	154.2	135.0	142.4	102.2	115.1	109.7
October ...	162.6	147.8	153.5	103.6	117.9	112.0
November .	184.0	158.3	168.2	106.2	119.7	114.2
December .	169.0	147.2	155.7	103.8	118.4	112.4
1917						
January ...	165.1	142.1	150.7	103.3	118.2	111.9
February ..	149.6	130.2	137.7	101.1	114.9	109.2
March	162.1	141.0	149.1	101.3	116.5	110.1
April	157.0	141.0	147.4	99.4	116.2	109.2
May	160.8	142.2	149.4	99.8	113.6	108.0
June	172.1	150.8	158.8	100.1	115.7	109.2
July	165.1	146.4	153.8	99.8	114.2	108.3
August	154.8	144.7	148.8	99.4	114.2	108.0
September .	141.5	133.0	136.3	96.5	111.3	105.1
October ...	131.2	127.6	129.0	95.1	108.5	102.9
November .	119.1	117.4	118.2	91.9	105.5	99.9
December .	120.2	116.8	118.0	89.6	104.1	98.0

* The New York Stock Exchange was closed from July 31 to December 12, 1914. No data were available for the month of August and September. Our indices for October and November were computed from unofficial quotations published in the *Financial Review.*

TABLE IV. — INDEX NUMBERS FOR THE PRICES OF

(1) Eight iron and steel common stocks
(2) Twelve other industrial common stocks
(3) Twenty industrial common stocks
(4) Eight iron and steel preferred stocks
(5) Twelve other industrial preferred stocks
(6) Twenty industrial preferred stocks

(Geometric average for 1909–13 = 100)

	(1)	(2)	(3)	(4)	(5)	(6)
1918						
January ...	132.4	130.2	131.1	91.5	107.0	100.6
February ..	143.5	140.1	141.6	92.1	109.8	102.3
March	141.7	138.9	139.9	91.7	110.0	102.2
April	142.6	140.8	141.3	91.9	110.0	102.3
May	153.8	150.0	151.6	93.6	112.0	104.2
June	156.0	155.0	155.5	93.0	112.7	104.6
July	159.6	159.0	159.3	93.6	114.4	105.7
August	161.5	162.0	161.8	94.0	115.4	106.4
September .	160.8	163.0	161.8	93.6	114.9	105.9
October ...	158.0	163.0	160.7	93.8	115.7	106.4
November .	149.1	160.9	156.0	94.7	116.2	107.1
December .	151.7	163.3	158.5	94.5	117.6	107.7
1919						
January ...	150.8	166.7	160.2	96.0	120.1	110.0
February ..	153.2	171.4	163.8	98.0	121.2	111.3
March	165.2	180.6	174.3	98.7	123.7	113.0
April	174.0	198.0	188.0	100.3	126.0	115.0
May	187.4	222.2	207.6	102.2	128.7	117.4
June	203.0	247.5	228.5	103.8	129.8	118.7
July	217.1	266.5	245.4	105.8	131.0	120.3
August	205.5	243.2	227.6	103.3	128.0	117.6
September .	216.4	249.2	235.7	103.3	128.7	118.0
October ...	233.5	266.5	252.6	103.5	128.9	118.2
November .	228.2	251.0	241.5	101.7	127.7	116.7
December .	216.1	239.6	229.6	100.1	126.4	115.1
1920						
January ...	222.4	248.6	237.9	99.6	126.4	114.9
February ..	201.4	226.8	216.2	97.8	123.1	112.2
March	208.2	231.6	221.8	97.8	122.6	112.0
April	214.4	239.0	228.7	97.8	121.4	111.4
May	195.5	214.6	206.8	93.2	117.4	106.9
June	199.1	213.2	207.4	92.0	116.2	105.8
July	200.0	206.4	203.7	92.5	114.4	105.1
August	187.0	183.5	184.9	91.6	109.8	102.2
September .	188.0	177.4	181.5	92.0	109.8	102.2
October ...	186.0	167.8	174.6	92.3	108.2	101.6
November .	171.4	150.4	158.5	91.7	106.0	100.1
December .	155.2	131.8	140.7	89.2	101.0	96.1
1921						
January ...	166.6	145.1	153.2	92.5	105.4	100.0
February ..	168.5	140.9	151.4	92.8	103.4	99.0
March	168.3	139.1	150.0	94.3	102.4	99.2
April	166.8	140.2	150.2	92.4	100.6	97.2
May	166.0	142.0	151.0	90.7	99.8	95.9
June	145.1	122.8	131.5	86.8	91.0	89.2
July	143.8	118.7	128.0	87.4	88.8	88.2